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Obituary.

THE LATE LIEUT.-COL. GEORGE ELPHICK, T.D., R.A.V.C. (T.F.).

ANOTHER strong link of our professional chain has been broken by the death of Lieut.-Colonel George Elphick, and our brethren in the North have lost a sincere friend and the profession a strong supporter, for a straighter man in all his dealings, whether professional or otherwise, never existed. As a horseman and a practical veterinarian who kept himself well ahead abreast of the times, George Elphick was an example to his profession, and in the branch, which he made his particular speciality (the examination of horses for soundness), he had few equals, and certainly none were better. His personal opinion was sought far and wide both by his clients and his professional brethren. A regular follower of hounds, and one of the boldest riders, his knowledge of a hunter was perfect, and it is not an exaggeration to say that he passed his opinion on more animals of this class than any other veterinary surgeon of his generation. He was the first veterinary officer of the Territorial Force to receive the Territorial Decoration, being with the Northumberland Hussars from 1871 to 1914. He was the finest swordsman in the regiment, and, in his keenness, never missing a training. Always ready to encourage

the student, it was he who gave the " Old Student's " prize for the Examination of Horses for Soundness at the New Veterinary College, Edinburgh, and on more than one occasion he voluntarily coached the students in that branch before they went up for their Examinations A kind-hearted, generous, open-hearted man, his purse was always open to help forward any scheme for the advancement of the profession, and his influence in this respect in the North of England was always used with this object. From 1893 to 1900 Col. Elphick was a Member of the Council of the Royal College of Veterinary Surgeons, and this body showed their confidence in him by electing him a Vice-President in 1898. It is a pity that such men should grow old and pass away, but their memory lingers, and the examples they have set prove worthy ones to be emulated for our younger members to do their best to follow.

Editorials.

VETERINARY RESEARCH.

At last the crying need for assistance on the part of some authoritative body, Government or otherwise, for Veterinary Research, has begun to be taken up by the general public, and we of the profession may hope that the matter will take tangible form, so that University and other laboratories will throw open their Scholarships and Bursaries equally for competition between the graduates of either branch of medicine, human or comparative. Given the opportunity, the young graduate in Veterinary Science will only too gladly seek the chance of specialising and prosecuting some particular research. He has the brains, and has acquired, during the curriculum necessary to obtain the diploma, a thorough groundwork in the clinical pathology of the diseases of animals—a groundwork of sufficient stability upon which to build up a superstructure of future work. What does he find when he qualifies? Practically nothing which will give a sufficient remuneration on which to live except private practice, unless he is one of the few fortunate ones who are successful with the Colonial Office or the Army.

The plums in the medical profession are much more numerous, and yet the field, quite a lot of it as yet untrodden, for original disease research in animals is enormous; and, what is more, a successful issue in this field may lead, as it has done before, the way to successful discoveries beneficial to man. Take, for instance, the Ultra-Microscopic Viruses, so ably discussed by Mr. F. W. Twort in the last and the current issues of the Veterinary Journal. In the veterinary world

there are a number of diseases placed in this category, notably foot and mouth disease, distemper, and rabies, to mention only three of them, and a discovery of a means whereby the causal organism of either of these could be demonstrated might open the door to influenza and a dozen others which attack man and are at present a puzzle to our medical confrères. It was a veterinarian (Theobald Smith) who first demonstrated the existence of the piroplasm as a factor of disease; and the discovery of the cause of Texas Fever in cattle paved the way to a new line of reasoning and a new line of thought, the result of which has been extraordinarily far-reaching and has benefitted human medical science enormously.

Veterinary research must of necessity be carried out to best advantage by the workers who are trained scientifically to understand the animal, and no one has that training so deeply rooted as the duly-qualified veterinary surgeon. He has been badly neglected in the past in Great Britain, and although for years asking for support, a mere Government pittance is all which has been accorded. Other countries have for a generation helped along Veterinary Research, and the laboratories open to veterinary workers in other European countries, in America, and our Colonies, make one think with shame upon what is left undone in Great Britain, the home of the best and most valuable of all the pedigree stock, horses, cattle, sheep, pigs and dogs, in the world.

The fault here has not altogether laid with ourselves this time, as we have for years, as a profession, been asking for opportunities; and yet perhaps to some extent we have been to blame, as the progress we have made (and no one can deny that we *have* made progress) has been made by our own exertions and our own individual efforts—in other words, we have been loyal to our principles in the fight against disease, even though it has meant great loss from our own pockets.

If, as one hopes from the remarks which have recently fallen from the lips of a great sportsman and one who is a true friend to our profession, attention is now drawn in earnest to the great need and pressing claims which Animal Disease Research has in relation to the health and wealth of the country, we may look forward to a real start being made in this direction; and, given the necessary pecuniary backing, the authorities and the public may rest assured that the brains are waiting. It only needs the opportunity to use them.

THE ONE PORTAL SYSTEM.

Our one portal system has again recently been under criticism, but that this is the best for us is a point upon which, if a plebiscite of the profession were taken, the result would be practically unanimous. There would scarcely be a dissentient vote, as there is no better guarantee to the general public (in whose interests the examiners are

appointed) that the graduates are properly and uniformly qualified. than the fact that they all pass through one and the same portal. Wherever they may be taught, the resulting diploma, stating that they are duly qualified to practise the science and art of Veterinary Medicine and Surgery, can only be obtained in one way, and that is by the sanction of the Board of Examiners elected by the votes of the Council of the Royal College of Veterinary Surgeons. *There are no back-doors, and this must always be so, for we are in this respect the envied of the other professions.* Once having gained the licence to practice, provided a student can afford to take a further year of study, other degrees are open to him, some being of University status—and our graduates have not failed to take advantage of this, for a considerable number are now additionally ornamented. Subsequent degrees and additional diplomas give professional status and increased knowledge, and as such should be the aim and ambition of all men to attain during their enthusiastic and early working years—*and it is just during their early poverty years that scholarships and bursaries are especially necessary and useful if the young graduate is going to get an opportunity given to him for consolidating his brain knowledge before having to turn out into the "rough and tumble" of meeting his expenses, and trying to "make both ends meet."*

THE NATIONAL VETERINARY ASSOCIATION MEETING.

THE "National" for 1922 is past—one of the most satisfactory and successful meetings ever held, both as regards enthusiasm, profitable scientific discussions, and social intercourse. The surgical demonstration day was especially crowded, and proved a great testimony to the popularity of that function. All went off as happy as a wedding feast, and the workers who arranged the whole affair, and who gave it much time and thought, especially the local officials, Messrs. Stableforth, Aveston, and Taylor, are to be congratulated on the success which attended their efforts. The value of these gatherings to each individual member of the profession cannot be over-estimated, and the Bath Meeting has done much to stimulate the recruiting of new members for the National Veterinary Association, which is now well on its feet and running strong. Not to be a member means losing and missing much, and not to attend the annual meeting means a loss professionally which cannot be calculated.

BOTULISM.

THE recent Botulism case, in which a number of people died as the result of eating certain food, brings forward again the importance of collaboration between the workers in human and veterinary medicine.

Botulism in animals is as well known as in man, and if the recent discovery by Mr. Basil Buxton, F.R.C.V.S., D.V.H., of a means of pre-

venting this disease in horses (Grass or Borna Disease, as it is termed in Scotland and the North of England) proves on more extended trial to be confirmed, it will open up a new era and conserve thousands of valuable lives, human as well as animal.

Once its value is established the work done by a veterinarian will again have led the way to a discovery which will be of enormous benefit to human life.

Excellent statistics on the preventive treatment of Grass Disease by this method have come to hand too late for the present issue, but will be dealt with in our next in full detail.

It now remains with the practitioner and the agriculturist to give the method an extended trial, and there is reasonable hope that within a few months cases of botulism in animals will have as little dread for the practitioner as milk fever has at the present day.

General Articles.

THE PAST, PRESENT AND FUTURE OF VETERINARY EDUCATION AND OF THE PROFESSION IN RUSSIA.

By HENRY PODGAEZ, M.R.C.V.S.,*

Doctor of Veterinary Science, and Doctor of Agriculture in the University of Karkov, Russia.

It is not possible to give a complete report of the past, present, and future of veterinary education and the profession in Russia in one article, as a whole book might be written on this theme; but I will endeavour to give an outline of principles on which the Russian veterinary system was, and is, based, and of the future prospects in that country.

Veterinary education was, and is, a State monopoly in Russia.

The Ministry of Education, before the Bolshevist revolution, and the Commissariat of Education, as it is termed to-day, constitutes the central body governing veterinary education.

Previous to the revolution there were four Imperial Veterinary Institutions in Russia, *i.e.*, Kharkov (Ukraine, S. Russia), Warsaw (Russian Poland, W. Russia), Uryev (Dorpat, N.W. Russia), and Kazan (E. Russia, Volga Provinces).

Uryev's (Dorpat) veterinary institution belongs now to Esthonia, which is now an independent border State, and was formerly one of the Russian Baltic Provinces

*Mr. Podgaez, a recent graduate of the R.C.V.S., is a British subject (having been born in Canada), who had the misfortune to get into the clutches of the Bolshevists, by whom he was condemned to death, and by whom he was eventually exchanged with his wife and child for three Bolshevists, and came as a refugee to England.—(Editor, Veterinary Journal.)

Warsaw's Veterinary Institution during the German offensive in 1915 was transferred to Moscow, but all valuable collections, instruments, and the library, were left in Warsaw.

During the civil war in 1918, 1919, 1920, several local governments (Siberia, Caucasus, etc.) attempted to establish local veterinary educational centres. As far as the author is aware they did not succeed in their aim, owing to the absence of scientifically trained lecturers, lack of funds, books, laboratories, buildings, and support from the agricultural and co-operative organisations.

As a consequence there are only two veterinary educational centres in Russia (Kharkov and Kazan), which possess good modern laboratories, cliniques, and a staff of experienced professors and lecturers.

The syllabus of lectures of veterinary institutions is very similar to that of the English Veterinary Colleges, and the standard of general education required for matriculation is equivalent to that of the High Schools.

The veterinary institutions of Kharkov and Kazan have managed to preserve their laboratories, cliniques, bacteriological and research departments, but have been greatly affected by what may be designated as the disintegration of all the elements and principles on which veterinary education have been based.

In Russia very few members of the veterinary profession were in private practice or owned veterinary hospitals. There were a few private veterinary hospitals in both capitals (Petrograd and Moscow) and in large provincial towns.

A young man qualified after four-and-a-half-years of training at one of the mentioned institutions, and would then be employed by the Ministry of Interior, Ministry of Agriculture, the Municipalities, Zemstvos (County Councils), or by the proprietors of large estates; or he might be enlisted in the Army Veterinary Corps.

In the ports and at the large railway stations there were veterinary officials appointed by the Veterinary Department of the Ministry of the Interior. It was their duty to control live stock arriving at the ports and proceeding by land or by rail. No consignment of live stock was allowed to come ashore, no herd passing by road or rail was allowed to proceed further, without a licence of health signed by these veterinary officers. They watched epizöotics and established, in cases of emergency, the line of quarantine and quarantine zones in their districts during the outbreak of such diseases as contagious pleuro-pneumonia of cattle, rinderpest, foot-and-mouth disease, hog cholera, etc.

The local authorities of a common district or province were bound to place at the disposal of this veterinary officer such a number of

armed and mounted police as was necessary according to the requirements of the moment in order to carry out the necessary compulsory measures for the detention and inspection of herds.

On the other hand there were no such veterinary organisations in rural districts as veterinary hospitals and dispensaries served by the veterinary officers appointed by the Zemstvos, *i.e.*, by the district and provincial bodies similar to the English County Councils.

The vast majority of about 400 veterinarians qualified yearly by the four Russian institutions had been employed by the Zemstvos.

Every year they used to add to their budget an estimate for the inauguration of new veterinary hospitals and dispensaries, and each veterinary hospital had a certain number of villages with a certain number of animals to be attended to.

The veterinary officials were paid a fixed salary, increasing annually, and were given quarters, fuel, lighting, and means of communication for visiting distant villages and farms. Staffs of grooms, attendants and qualified assistants of veterinary surgeons (feldshers) were paid a salary by the Zemstvos, too.

The veterinary hospitals were supplied with drugs, instruments, etc., by the veterinary departments of the Zemstvos, and medicine, advice and treatment were given free to peasants.

Small and large landowners and peasants contributed to the Zemstvos in taxes the necessary funds for the upkeep of this veterinary organisation.

The Ministry of Agriculture had its own staff of veterinary zootechnical officers who had the control of the Government and private breeding establishments.

The slaughterhouses had been owned by the municipalities, Zemstvos, and co-operative organisations, and meat inspection, being compulsory, was carried on by the veterinary officers employed by these bodies.

Vaccines, serums, tuberculin, mallein, etc., were prepared and standardised by the Institutions of Experimental Medicine in Petrograd and Moscow, and by the Bacteriological Departments of four Russian Veterinary Institutions, Kharkov's (Zenkovsky's) and Kazan's (Lange's) anthrax vaccines being well known throughout Russia.

Many Zemstvos had bacteriological laboratories of their own, where vaccines and sera were prepared and diagnostic and biological tests were made, and all these bodies employed a huge staff of qualified veterinarians—bacteriologists.

This complicated machinery of veterinary control, though bureaucratic in its principle and sometimes inefficient, yet worked

wonderfully well, and remarkable results have been achieved by localisation of the two scourges of agricultural Russia, contagious pleuro-pneumonia of cattle and rinderpest.

Before the revolution European Russia was free from these diseases, which had been confined to a few districts of Western Siberia and of Transcaucasia.

The Bolshevist revolution in October, 1917, and the self-demobilisation of the Russian armies, performed without any plan, afterwards brought about a great deal of epizöotic disease in the provinces adjoining the former front. The Provinces of Kherson, Podolya, Kieff, Volyn, Moguilijev, Pscov, etc., became severely infected with glanders and mange, disseminated by the large number of army horses sold by the demobilised soldiers to local peasants without being duly inspected by veterinarians.

Then came the civil war with its horrors.

The richest agricultural provinces of Russia, Western Siberia, Volga region, Ukraine, Crimea, Cuban were crossed and devastated several times by the hostile White and Red Armies in 1918, 1919, and 1920. The Russo-Polish war of 1920 devastated the Western Provinces of European Russia, Podolya, Volga, Kieff, Minsk, Moguilijev, etc.

The different armies marching to and fro extensively requisitioned the cattle, horses, pigs, poultry, etc., without providing the necessary number of live stock for breeding purposes and as working power for land cultivation.

Then came the horrible epizöotics disseminated throughout Russia by marching and retreating armies from the distant localities where they had been placed.

Anthrax, glanders, rinderpest, contagious pleuro-pneumonia of cattle, foot-and-mouth disease, hog-cholera, swine-erysipelas, rabies, mange—each of them contributed to the disappearance of the comparatively dense animal population of Russia.

The following table may illustrate the sequelæ of revolution, civil war, epizootics, and famine on the animal population of Russia :—

	1914	1922
Horses ..	22,000,000	8,000,000
Cattle	18,000,000	6,000,000
Sheep	4,500,000	2,000,000
Pigs	12,000,000	3,000,000

(Russia Liberation Committee Statistics.)

The obligatory annual vaccinations against anthrax, hog-cholera and swine erysipelas have been discontinued, partly owing to the rebellious condition of the country making it impossible to induce

the peasants to vaccinate their stock, but chiefly owing to the absence of veterinary personnel and lack of vaccines, syringes, needles, etc.

The veterinary personnel of the Zemstvos and of the former Ministry of Interior were mobilised both by White and Red Armies alike, and the rural districts were left without veterinarians, drugs, and instruments.

When the author of this article left Kharkov for London in November, 1920, the whole of the Ukraine had been declared affected by rinderpest, and a special committee for combating this disease had been formed by the Commissariat (Ministry) of Agriculture of the Ukraine.

Though the civil war and foreign intervention are over, the great majority of veterinarians are in the Red Army. The few remaining members of the profession are working as clerks in the Veterinary Departments of the Central and Provincial Commissariats of Agriculture. Some members of the profession have been converted to the Communist faith, but their number does not exceed ½ per cent.

The central and local commissariats of agriculture have replaced the former Ministry of the Interior and Zemstvos. One cannot live on the salary paid in worthless paper roubles by the veterinary departments of these bodies. The agricultural districts are left without veterinary personnel, without drugs, instruments, vaccines; and all measures for combating the epizootics have failed to be brought into existence and remained only on paper, owing to the above-mentioned causes and famine.

Dogs and cats are exterminated in the towns; cattle, horses, pigs, poultry, rabbits are slaughtered for food, as there is no fodder to feed them on. Nobody takes care to ascertain whether the animals intended for food are healthy and whether their flesh is fit for human food or not, as the cravings of hunger are stronger than the fear of poisoning or infection.

No laws observed in civilised countries are applicable in a country where cannibalism has become an every-day fact.

One does not think of the possibility of medication and cure of animals in a country where human beings are left without medical help and medicine, where human carcases are lying in thousands on the streets and are waiting for their turn to be buried in the cemetery or to be eaten by their starving countrymen—where young girls of the tender ages of 8, 10 and 12 sell their innocence literally for a slice of bread.

This is not exaggeration of what is really going on in Russia, but a statement based on the facts reported daily in the Bolshevist papers, such as the *Red Gazette* and the official *Izvestia*.

The working powers of veterinary institutions are practically at a standstill.

There are no scientific books, no instruments, no drugs, and no students at the Veterinary Institutions.

Since the Bolsheviks have abolished their system of supplying the students with clothing and food rations and have established high fees for admission to the Veterinary Institutions, the number of students has decreased, and lectures have frequently to be delivered before empty benches.

One cannot teach and cannot study when every hour of one's life is absorbed by the one desire of how to alleviate the horrible cravings of hunger and how to procure a slice of bread, a cat or a dog for dinner.

The present state of veterinary education and of the profession in Russia may be determined by four terrible words: Barbarism, Desperation, Poverty, Bankruptcy.

Like a beggar the veterinary Russia stands on the threshold of the civilised world asking for bread, for particles of the treasures of science of which she has been robbed during the revolution, civil war, foreign intervention and occupation and famine.

What are the prospects for the future of veterinary profession and education in Russia?

It depends on the political situation, both external and internal.

Slowly, gradually, the Communist Oligarchy returns to the old recognised methods of democracy.

Whatever is the future Government of Russia, it will be confronted with the superhuman task of the resuscitation of agriculture, as the peasant class represents 90 per cent. of the whole population.

Agriculture is unthinkable without live stock.

Hence my firm belief is that there is a great future for the veterinary profession in Russia unless the Bolsheviks throw the Russian people into another war or similar adventure.

The nucleus of the former magnificent veterinary organisation has been saved.

The members of the profession, with the faith in progress and evolution so peculiar to the Russian educated classes, will create a new powerful system of veterinary control worthy of such a great country as Russia is, even now, impoverished, distressed and overpowered, as it is at the present, by a handful of political blackguards.

SOME OBSERVATIONS ON THE SOJOURN OF OATS IN THE HORSE'S STOMACH.

By T. G. BROWNE, M.R.C.V.S.
Professor of Anatomy in the Royal Veterinary College of Ireland.

It is generally recognised by physiologists that the chief function of gastric digestion in the horse is its action on the protein constituents of the food; hence it would follow that its importance for the different foods varies directly with the percentage of these constituents present. To what extent this is true has not been estimated, but the fact remains that the gastric glands secrete a fluid whose action is almost entirely confined to the breaking down of proteins. Irrespective of the production of gastric juice it must be admitted that the stomach has other functions of a more physical nature to perform. The left half of this organ does not contain true gastric glands, and is in reality only the dilated end of the œsophagus. This portion, therefore is comparable to the first three stomachs of the ox, and serves chiefly as a reservoir for food, while the remaining portion plays a dual part by both retaining food and secreting gastric juice. Still another function of this organ, and this may not be the least important, is its power, through the action of the pyloric sphincter, of regulating the flow of food material passing into the intestine so that no portion of this material is hurried along the small intestine unduly rapidly. It is obvious, therefore, that any factors which interfere with this normal flow into the intestine, as by causing a sudden gush of gastric contents to leave the stomach, will derange the normal digestion function not only of the stomach, but also of the small intestine. For example, it has been proved by experiment that if certain rules are not observed during feeding as to the time water is given, a large proportion of the stomach contents may be swept into the intestine and carried into the cæcum in a few minutes. Having regard to these facts, it is obvious that it should be the aim of the feeder to arrange the parts of a meal so as to interfere as little as possible with the normal flow of gastric contents into the intestine, and to retain those foods richest in protein constituents in the stomach for the longest possible time, so that they may be subjected to the maximum period of gastric digestion; otherwise the animal may not obtain the fullest possible nutriment from the foods consumed, and it is not improbable that attacks of colic may be induced. By judicious feeding it is possible to attain these objects, at least to a large degree, as, for example, by giving the water only when the stomach contains a fair quantity of hay, and by feeding oats after hay, the former being richer in digestible proteins than the latter. In feeding horses, therefore, special attention should be given to the sequence in which

the different parts of a meal, chiefly water, hay and oats follow one another.

With a view to ascertaining certain facts in regard to this sequence, and thereby arriving at some conclusions in connection with the factors which influence the sojourn of oats and hay in the stomach and their normal flow into the intestine, I conducted a series of experiments with the animals, which were afterwards used as dissection subjects.

Much valuable work in this connection has been done by Colin, Ellenberger and others, but there still appears to be certain facts in regard to these factors which have not yet been fully investigated or at least not sufficiently interpreted to bring out their practical bearing.

These experiments are arranged under two headings :—

(1) The influence of watering at different stages in a meal on the sojourn of oats and hay in the stomach.

(2) The influence on the sojourn of oats in the stomach of feeding hay immediately after the oats and *vice versa*.

In considering the first of these questions it is essential to have a clear conception as to the manner in which oats, hay and other foodstuffs normally arrange themselves in the stomach. On examination of the stomach of a horse which has been recently fed on a succession of different foods which are not fluid, it is evident that the contents are not churned but simply squeezed and pressed. The foods do not mix (except at the pylorus) but are simply pressed together, a sharp line of demarcation distinguishing them ; this arrangement they maintain from their arrival in the stomach until they reach the pylorus. For example, if a horse be fed on hay, maize and oats in succession, the stomach on examination will be found to contain these foods quite unmixed and arranged in strata in order of their arrival, the first consumed being at the pylorus and greater curvature, and the last being towards the left extremity. As one would expect, the first food consumed is always the first to pass out of the stomach, but it does not follow, however that the whole of the first food consumed passes out of the stomach before any portion of the succeeding food enters the intestine, for after a time the foods mix at the pylorus and pass out together. The point of practical importance is that the first food to reach the stomach is always the first to enter the intestine unless the natural arrangement of these foods in the stomach is by some means disturbed.

It is generally believed that this natural arrangement is always disturbed by watering immediately after feeding, and that a large proportion of any of the foods in the stomach may be thus washed

directly into the intestine irrespective of the order in which they had been consumed. It is true that this occurs if little or no hay has been consumed and the meal has consisted largely of oats or other concentrated foods, but in my experiments where the animal was watered immediately after a meal, one part of which consisted of at least 45 minutes' feeding on hay, I did not find this to be the case.

In all the following experiments the animals were destroyed while under the influence of a general anæsthetic by section of the common carotid artery, and the average time which elapsed from the moment the animal was cast until it actually expired was half an hour.

It has been shown by Colin that oats take up about their own weight of saliva and hay about four times its weight during mastication. It is on this basis that the weight of oats and hay in the stomach has been calculated in these experiments :—

(1) Two aged geldings, about 15 hands, were fed solely on hay and water for four days prior to destruction, but were allowed to fast during the night before destruction (about 16 hours). Next morning they were watered and fed for 1½ hours on hay, and immediately afterwards each animal was given 3 lbs. crushed oats which were consumed in one case in twenty minutes and in the other in half an hour. Immediately each animal had finished the feed of oats it was cast and destroyed. On post-mortem examination the stomach contents in both cases were found to be comparatively dry. The oats were confined to a layer three or four inches in thickness in the left extremity and extending some distance along the greater curvature, but none had reached the intestine.

(2) Three aged animals, two mares and a gelding, each about 15 hands. Fed solely on hay and water for several days before destruction, and during experiment were treated exactly similarly to animals in No. 1, that is, they were allowed to fast during the night before destruction and next morning were allowed to feed on hay for one hour and each animal was then given 3 lbs. of crushed oats. In this experiment, however, the animals were allowed to drink water coloured with magenta immediately after the consumption of the oats. One animal drank one gallon and each of the others drank three gallons. In each case about five minutes after the animal had finished drinking it was cast and destroyed.

On post-mortem examination the arrangement of the hay and oats in the stomach and the consistence of the stomach contents in all cases were exactly similar to those in experiment No. 1.

In this experiment the subsequent passage of water through the stomach did not disturb the arrangement of the hay and oats to any marked degree, although a small quantity of hay and a few oat grains

were washed into the duodenum. The stomach contents were stained by the magenta only on the exterior, the magenta-coloured water having evidently passed through the stomach between the stomach wall and the stomach contents without mixing with the latter, and only washing a very small quantity into the intestine. The magenta-coloured water had passed along the small intestine to near the ileo-cæcal valve in the case of the animal which drank one gallon, but in the other two cases it had only passed back a little more than half the length of the small intestine.

(3) Aged mare about 14 hands. Fed on hay and water for five days before destruction. On the evening of the fifth day the animal was allowed to drink two gallons water and to feed on hay for two hours and was then given 3 lbs. crushed oats. Next morning (18 hours afterwards) the animal was cast and destroyed, no food or water having been given in the meantime.

On post-mortem examination the stomach was found to contain only a very small quantity of masticated hay and oats, and the contents were semi-fluid. Almost all the oats therefore had left the stomach. They were found scattered through the contents of the small intestine, the cæcum and the first portion of the double colon, and a few husks could be traced as far as the pelvic flexure.

(4) Aged mare about 14 hands, fed and destroyed under conditions identical in every respect with those in No. 3, but in this case the animal was allowed to drink three gallons magenta-coloured water immediately after the feed of oats.

On post-mortem examination the distribution of oats in the stomach and intestine was found to be exactly similar to that in No. 3. The magenta-coloured water was found chiefly in the cæcum, but traces of the magenta staining in the intestinal contents could be made out as far as the pelvic flexure of the double colon.

In comparing experiments Nos. 3 and 4 it would appear that, provided the oats be fed after a feed of hay, it is immaterial as regards the fate of the oats whether the water be given before or after the meal. In experiment No. 4 the consumption of water immediately after the oats had apparently no detrimental influence on their digestion, or at least no influence in causing them to be carried faster through the intestine than if no water had been consumed after the feed.

(5) A gelding, about 16 hands, fed on hay and water for several days prior to experiment was allowed to fast during night before destruction (12 hours); following morning 3 lbs. of oats were given and these were consumed in 20 minutes. Immediately the oats were consumed the animal was cast and destroyed.

On post-mortem examination the stomach contents were almost semi-fluid, nearly of consistence of thin porridge, and apparently consisted entirely of masticated oats; weighed 7 lbs. after excess of fluid had been got rid of by filtering through thin muslin. Only a few oat grains had passed into the intestine for a distance of 1½ ft. This experiment would indicate that when a moderate feed of oats is given to even a hungry animal very little, if any, passes into the intestine during the time of feeding. One other experiment was carried out with a similar result.

(6) An aged mare. Fed and fasted in exactly the same manner and under conditions similar in every respect to those in No. 5, but in this case the animal was allowed to drink one gallon of magenta-coloured water immediately after the feed of oats.

On post-mortem examination the stomach contents were more fluid than in No. 5, and apparently consisted entirely of masticated oats; weighed 4 lbs. after excess of fluid had been got rid of by filtering through thin muslin. The duodenum for the first 2 ft. was almost full of masticated oats, and these became gradually less on passing backward along the intestine, until only a few grains could be found 30 ft. from the stomach.

The magenta colour could be recognised mixed with the stomach contents and staining the contents of the small intestine for the first 60 ft.

(7) An aged gelding fed and fasted in exactly the same manner and under conditions similar in every respect to those in Nos. 5 and 6, and the animal was allowed to drink two gallons of magenta-coloured water immediately after the feed of oats, as in No. 6.

On post-mortem examination the stomach contents were similar to those in No. 6, and weighed 4½ lbs. after excess of fluid had been got rid of by filtering through thin muslin. The oats did not fill the first part of the duodenum, as in No. 6, but were scattered along the whole length of the small intestine.

The magenta colour could be recognised mixed with the stomach contents of the small intestines for the entire length of the latter, but apparently had not yet entered the cæcum.

In comparing experiment No. 5 with Nos. 6 and 7 it is evident that in the last two the water consumed after the feed of oats became mixed with the semi-fluid stomach contents and washed a considerable proportion of the latter directly into the intestine. On the assumption that the oats took up their own weight of saliva it is obvious that in experiments Nos. 6 and 7 the stomach contents would have weighed at least 6 lbs. immediately after the feed of oats, and to this must be added a certain quantity of material which must have been present

in the stomach before the feed, for the stomach of the horse is rarely entirely empty, even after a 12 hours' fast. It is now evident that in experiments Nos. 6 and 7 almost half of the stomach contents weighed only 4 and 4½ lbs. respectively, after excess of fluid had been got rid of by filtering through the muslin.

In comparing the consistence of the stomach contents in all the above experiments it is apparent that a feed of hay (lasting at least from 45 minutes to an hour) is capable of absorbing a much larger proportion of the gastric fluids than a feed of oats, for in all those cases where the stomach contained a moderate quantity of hay the stomach contents had lost their fluid characters and were comparatively dry in consistence, while in those cases where no hay had been fed during the meal, and the stomach contained only oats, the contents were semi-fluid or almost liquid in character. This is a matter of some practical importance, for it is not difficult to understand that the more fluid in character the contents of the stomach the more readily miscible with fluids they become, and therefore the larger the proportion of these contents swept into the intestine by the subsequent consumption of water; again, on the other hand, the more solid in character these contents are the less readily will they become mixed with fluids, with the result that the water is then carried through the stomach over its contents direct to the intestine without carrying any appreciable quantity of food material with it.

SUMMARY OF CONCLUSIONS.

1. If the contents are fluid or semi-fluid in character, water then consumed readily mixes with these contents and carries a large proportion directly into the intestine and sometimes as far as the cæcum.

2. If the stomach contents have lost their fluid character, water then consumed does not readily mix with them, but passes over their exterior, between them and the stomach wall, direct into the intestine, without disturbing the natural arrangement of the foods in the stomach to any marked degree, and without washing any appreciable quantity into the intestine.

3. If oats be fed alone, especially to a hungry animal, they are not capable of absorbing sufficient gastric fluids to render the stomach contents comparatively dry, so that these contents become semi-fluid, with the result that the consumption of water immediately afterwards will carry a considerable quantity of the oats directly into the intestine, and in a very short time into the cæcum before they have been subjected to any appreciable digestion in the stomach or small intestine.

4. If a horse be fed on hay for at least one hour the consumed hay is capable of absorbing the greater part of the gastric fluids and

the stomach contents thus lose their fluid character, with the result that oats fed soon afterwards will become deposited towards the left extremity of the stomach, and water subsequently consumed will behave as described in conclusion No. 2, so that little if any oats will be washed direct into the intestine.

5. A horse may drink water with impunity immediately after a feed of oats provided the oats have been given after a feed of hay. This is a matter of some practical importance, for very often a horse will partake of water immediately after a feed of oats, even though he has refused to drink a short time before.

6. If a meal consists entirely of oats, the water should be given first, but should the meal consist of hay (fed for at least one hour) or hay followed by oats, the water may be given at any time the animal is inclined to drink.

7. If the rule of feeding hay first and oats afterwards be observed, the animal may be allowed free access to water at all times.

8. Water passes rapidly through the stomach and along the small intestine to reach the cæcum in a very short time, usually within 15 minutes. When the stomach contents are comparatively dry the water passes over their whole exterior and is not confined to a direct route along the lesser curvature between the cardia and pylorus.

In discussing the question of the sequence in which hay and oats should be fed, it is first necessary to explain how these foods behave in the stomach during and after feeding. When the food enters an empty or almost empty stomach, it passes towards the pylorus, and as more is consumed, it, after a time, commences to pass into the intestine, but the amount passing out of the stomach does not at first equal the amount entering it, with the result that the stomach becomes gradually distended, and when two-thirds full, which is the condition in which most active digestion occurs, the amount passing out will, if feeding be continued, equal the amount being swallowed, so that there is now a stream passing out at the pylorus while a corresponding quantity is entering by the œsophagus. The stomach of the horse is relatively small, and when its capacity is compared with the relatively large bulk of food the animal is capable of consuming at a feed, it is obvious that the stomach during an ordinary meal must discharge into the intestine a volume of food at least equal to two or three times its capacity. It is now easy to understand that during a feed the amount of food passed out of the stomach will be in direct proportion to the volume consumed; thus, if the meal consists of hay, a larger porportion will pass out than in the case of oats. In fact, in the case of oats, if a small or moderate feed be given alone a little or none will have left the stomach by the time the feed is finished. The flow of

chyme from the stomach into the intestine becomes slowed down, immediately the animal has finished feeding, to such an extent that it will be many hours before the stomach is empty, but had the outflow continued at the same rate as during the meal, the stomach would probably have been empty in an hour. The last portion of the contents evidently passes out very slowly, for the stomach is never empty except after many hours' starvation. It is now apparent that the first portion of either a large or even an ordinary sized meal has a comparatively short sojourn in the stomach, while the last portion is allowed to remain there for a considerable time, and a small quantity may not leave until even the commencement of the next meal. In the light of this knowledge, and keeping in mind that oats are richer in digestible proteins, and therefore require a longer gastric digestion than hay, it is evident that oats should be fed after hay. This, however, is not the usual practice of feeding in this country, oats being usually fed first on the assumption, as advocated by some authors, that a certain amount of hay, usually a moderate quantity, is always left in the stomach from the previous meal, and that the presence of this hay may prevent the oats from passing out too early. It is true that in the method of feeding oats first little, if any, will leave the stomach for 20 minutes or so after the commencement of the feed, that is during the time the oats are being consumed, but once the animal begins to consume the more voluminous material, "hay," the oats begin to pass out rapidly, much more rapidly than if the meal had been continued on oats. It is therefore apparent that oats, especially the last portion consumed, when followed immediately by hay have a comparatively short sojourn in the stomach, undoubtedly shorter than is necessary for their thorough gastric digestion.

The following experiments illustrate the behaviour of hay and oats in the stomach, and give some indication as to the time oats will remain in the stomach when fed before and after hay.

EXPERIMENTS WHERE OATS WERE FED ALONE AND ALSO AFTER HAY.

1. Large gelding about 16 hands. Fed on hay for two days, but was allowed to fast during night before destruction (about 14 hours). Next morning at 7 given 4 lbs. of oats. Destroyed at 11 a.m., nothing having been given in the meantime.

Post-mortem examination. Stomach contents semi-fluid, and consisted entirely of oats mixed with the fluid; weighed 5 lbs. 8 ozs. after excessive fluid had been got rid of by straining through thin muslin. Oats were scattered along small intestine, and a few were present in cæcum and first two feet of double colon.

2. Aged Shetland pony allowed to fast during night before destruction (16 hours). Next morning at 9.10 a.m. given water and hay and

allowed to feed on hay until 10.20 a.m. when hay was withheld and 2 lbs. of oats were fed. Nothing more was given, and the animal was destroyed at 12.10 p.m.

Post-mortem examination. Stomach moderately full and contents comparatively dry. Oats occupied the left half of the organ and extended along lesser curvature to pylorus and some distance along greater curvature. Hay and oats not mixed, being separated by a well defined boundary line. Oats weighed 3 lbs. A few oat husks were scattered along the entire length of small intestine.

3. Aged gelding about 15 hands in height. Fed on hay for three days before experiment, but was allowed to fast during night before destruction (16 hours). Next morning at 9 a.m. was watered and given hay and was allowed to feed on hay until 9.45 a.m. Hay was then withheld and 4 lbs. of oats fed. Nothing more was given and animal was destroyed at 3.10 p.m.

Post-mortem examination. Stomach contents pultaceous in consistence, and weighed 6 lbs.; they consisted to a large extent of oats, but these were mixed with the hay. Oat husks were scattered throughout the small intestine and cæcum, and a few could be traced about 2 ft. into the double colon.

4. Aged gelding about 14 hands high. Fed on hay for two days before experiment. On evening before destruction, at 5 fed and watered as usual; at 10 same evening given 4 lbs. oats. Nothing was given afterwards, and the animal was destroyed next morning at 10.30.

Post-mortem examination. Stomach contents pultaceous in consistence; weighed 1 lb. and consisted of a mixture of hay and oats. A few oat husks in small intestine, but these were numerous in the cæcum and first and second portions of double colon.

Experiments Where Oats Were Fed Before Hay.

1. Pony about same size as No. 1 in above experiments. Fed for two days on hay and was allowed to fast during night before destruction (16 hours). Next morning at 9.15 was watered and given 2 lbs. oats, which were consumed in 25 minutes; then fed on hay for one hour and ten minutes and then destroyed.

Post-mortem examination. Stomach full; contents comparatively dry. Only a small quantity of oats present at lesser curvature, and a few grains at greater curvature. Oat husks scattered along entire length of small intestine, and a considerable proportion present in cæcum, but none in double colon.

2. Aged mare. Fed on hay for two days before experiment, but was allowed to fast during night before destruction (14 hours). Next

morning at 7 watered and given 4 lbs. oats and then allowed free access to hay for five hours.

Post-mortem examination. Stomach moderately full; contents comparatively dry. Oats weighed 2 lbs. and were placed in a thin layer along greater curvature. Oat husks scattered along small intestine, also throughout cæcum and in first 3 ft. of double colon.

3. Aged gelding about 15 hands high. Experiment similar to No. 2, except that the animal was allowed free access to hay for seven hours after feeding on oats.

Post-mortem examination. Stomach moderately full; contents relatively dry; oats had almost entirely disappeared from stomach, only a few grains being present near pylorus. Oat husks very few in small intestine, but numerous in cæcum and first portion of double colon, and a few could be traced in second portion as far as the pelvic flexure.

In reviewing the above experiments the following conclusions may be arrived at :—

1. Where oats are fed before hay to a hungry animal the oats are carried out of the stomach much faster than when fed alone or after the hay.

2. When oats are fed at the end of the meal, that is, after the hay, a certain quantity will remain in the stomach for at least 12 hours.

3. When oats are fed first to a hungry animal and the animal is then allowed free access to hay, the greater part of the oats will have left the stomach within two hours, but a small quantity may be allowed to remain as long as seven hours, and occasionally even longer.

4. Oats should always be fed at the end of the meal.

A THEORETICAL STUDY OF THE NATURE OF ULTRAMICROSCOPIC VIRUSES.

By F. W. TWORT,
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(Continued from page 283.)

Throughout this paper the view has been taken that there is no proof that any true ultramicroscopic virus has been seen or grown. Certain claims, however, in these respects have in recent years been made by different workers. One of the most notable of these is the staining of certain minute bodies in films made from the excreta of lice believed to be infected with typhus. These have been named Rickettsia bodies, and are believed to be definite micro-organisms. They certainly show a uniformity of size and shape which lends support to this view, but they have not been cultivated, so that it is impossible to prove that they are the causative agent of the disease. Moreover,

their size is larger than one might expect if typhus fever is caused by a true ultramicroscopic virus, and from a rough comparison they appear to be nearly, if not quite, as large as the delicate vibrio-spirilla which I isolated from soil. They show also more definite characters than one would expect to find if they belonged to one of the theoretical forms of precellular life. It must, however, be remembered that the Rickettsia bodies are quite easy to see, yet bodies of a similar nature have not been demonstrated in such well-known diseases as anterio-poliomyelitis, swine fever or vaccinia.

Perhaps the most frequently discussed experiments on the cultivation of the ultramicroscopic viruses are those which have been carried out in Noguchi's medium. Many workers claim to have grown a number of well-established ultramicroscopic viruses on this medium. These experiments, in some cases, have been severely criticised owing to the undoubted presence of contaminating bacteria, which have become degenerated and partially broken down into granules on account of the conditions being unsuitable for their growth. The experiments, however, of every worker do not appear to be open to this criticism, and at the present day further work is being carried out in the same direction. For our present purpose it will not be necessary to discuss the experiments on each disease separately, for the diseases include those which are undoubtedly caused by an ultramicroscopic virus, and the method of experimentation is very similar in all cases. The chief evidence of their growth consists of a turbidity which appears in the lower layers of the Noguchi tubes, and gradually increases in density and creeps up the tube. It is claimed that a similar turbidity is produced in sub-cultures, but not in the uninoculated control tubes. bodies which present a rather indefinite or hazy outline. In shape they may be round, but are more often slightly elongated. It is claimed in some cases that the disease from which they were obtained has been reproduced by inoculation of portions of the sub-cultures, but it has not yet been proved that this can be done with sub-cultures sufficiently far removed from the original cultures to eliminate the possibility that the sub-cultures may merely represent dilutions of the virus introduced into the original tubes.

Previous, however, to the introduction of Noguchi's medium, other workers claimed to have observed an increase in the quantity or virulence of an ultramicroscopic virus when the infected tissue was placed under some special condition. One can occasionally observe a similar increase in the case of certain bacteria, that require a special medium, when they are inoculated on to ordinary agar. Indeed, one would expect some increase of an ultramicroscopic virus to take place in a Noguchi tube, although it might not multiply in sub-culture.

Definite evidence of multiplication would be obtained by the infection of animals with cultures obtained after repeated sub-culture, but even this would not be conclusive proof that the bodies observed under the microscope were the organisms forming the virus. The presence of granules and tiny globules is so common on media containing fresh animal tissue, especially if the conditions are suitable for the action of any enzyme these may contain, that it is difficult to be certain that the granules are not a part of the broken down medium. It would be much more conclusive if a surface growth were obtained on some solid medium. Some workers claim to have obtained such surface growths, but unfortunately blood has been used in the preparation of most of these media. Anyone who has worked with blood agar knows only too well how common it is to get a film formation on the surface of an uncontaminated tube of medium, and I have on more than one occasion observed that this film when transplanted on to the surface of fresh tubes seems to start a film production on the sub-culture.

The presence of some visible change in tubes of sterile media is an occurrence which may be observed under various conditions, and in view of the opalescence formed in Noguchi's medium in experiments on the ultramicroscopic viruses, a short description of some of the more subtle of these changes may not be out of place. I have already noted the film formation which may occur on the surface of blood agar. If, however, a few drops of sterile blood, instead of being mixed with the agar, are pipetted into tubes of sterile broth, and the whole incubated for 24 hours, the blood corpuscles will settle to the bottom of the tubes. The upper fluid at first remains moderately clear, but after further incubation it is not uncommon for an opalescence to be formed. It is important to note that this opalescence varies in different tubes, while the condition of the animal from which the blood was taken is an undoubted factor which influences its formation. I observed it frequently in blood cultures made from cases of acute rheumatic fever. Films of these cultures, when stained by a silver process, showed definite spirilla-like bodies which were often attached to the blood platelets ; yet after making repeated cultivations from the blood of normal men, some of these cultures showed similar forms. Further experiments left little doubt that they were not micro-organisms, but were minute fibrils, possibly connected with the formation of a clot in a very dilute blood solution. When films were made directly from the sterile blood, some extremely delicate curved forms were found, but these were also observed in slides of control blood. In this instance the evidence pointed to the " spirilla " being fragments of flagella which stuck to the formalin fixed slides, and came from bacilli which were present in the distilled water used in the staining

experiment. Another instance where opalescence is formed in fluid cultures is when these are made from filtrates of soil. The medium in this case consists of the soil filtrate, and while it may be argued that the opalescence here observed represents the growth of an ultramicroscopic virus, I have never been able to obtain any evidence that this is so.

Many other instances of somewhat similar changes in culture media might be given, but it will be sufficient to describe one more which will demonstrate the possibility, under special conditions, of obtaining definite colony-like formations on the surface of sterile solid media. The experiments were carried out to test the possibility that an ultramicroscopic virus may require some unusual salt or gas, which is known to be the case with bacteria belonging to the sulphur, iron, and nitrifying groups. In these experiments one of the media used consisted of ordinary agar, to which has been added 0.05 per cent. of sodium sulphide. The tubes were inoculated with a few drops of an emulsion of garden soil which had been passed through a Berkefeld filter, and were incubated at 37 deg. C. In a few days some minute colony-like formations appeared along the needle track. These gradually increased in size, but remained confined to the central line, while control uninoculated tubes remained quite clear. When sub-cultures were made those from the inoculated tubes showed a large number of minute colony-like formations along the needle track, but none developed in the control sub-cultures. When the supposed growth was made into an emulsion and passed through a porcelain filter, the filtrate retained the power of causing similar formations on fresh tubes of medium, but this power appeared to be lost when the filtrate was heated to 80 degs. C. Many additional experiments were carried out, but it will be sufficient here to note that the final experiments indicated that the supposed colonies were nothing more than tiny grains of sulphur which had arisen from the sodium sulphide in the medium. Their formation being started by some minute particle in the original soil filtrate somewhat in the same manner that crystallisation is started by the presence of a minute crystal. Control tubes inoculated with a small quantity of sterile sulphur developed similar formations which could be "sub-cultured" to fresh tubes.

Experiments on filter-passage usually occupy an important place in any investigation on the ultramicroscopic viruses. There are, however, certain factors which are sometimes not sufficiently appreciated when conclusions are drawn from these experiments. It is well known that the nature of the fluid, its viscosity, and its reaction to litmus paper are all factors which influence the passage or otherwise of any particles in suspension. The length of time the fluid is passing,

and the pressure that is used, as well as the temperature at which the operation is carried out are additional factors, and even certain electrical changes play some part in the process. The structure and composition of the virus or bacterium appear, however, to be of still greater importance, as is well illustrated in the case of yellow-fever. Here the virus is known to pass a fine porcelain filter, yet the leptospirillum of Noguchi, which is believed to be the virus, is an organism of not inconsiderable size. The mouse spirochaete and the vibriospirilla which I cultivated, although smaller than the leptospirillum, will not pass a Doulton white porcelain filter. It is also interesting to note that with incubated emulsions of grass and soil, certain large bacilli more frequently pass than some other much smaller varieties. In the case of bacteria, the composition of the medium used for their *cultivation* is often the factor which determines their passage or not through a filter. This was well demonstrated with my spirochaete and vibro-spirilla; these organisms passed a Berkefeld filter when they were cultivated on fluid media, but showed no sign of passage when the fluid medium was simply used to obtain an emulsion of a growth obtained on solid media. Moreover, this difference is not limited to a question of employing a solid or a fluid medium, but may be observed with different fluid or with different solid media.

The various experiments on the ultramicroscopic group of viruses show quite clearly that great care must be exercised in drawing conclusions from experimental results. Attempts at cultivation produce phenomena which range from the deposit of simple chemical substances to the action of au enzyme, and from this to the increase of a transmissible enzyme, and to the formation of definite bacterial colonies. There are, nevertheless, certain points of importance which are of assistance in determining the probable nature of an ultramicroscopic virus. They are unlikely to be simple chemical substances which possess the property of inducing the formation in the animal body of a further quantity of the substance, in a manner similar to the production of sulphur grains, to which reference has already been made. The fact that the viruses are destroyed at a comparatively low temperature, and that they stimulate the host to produce a high degree of immunity, are strong points against such a hypothesis. It also seems improbable that they are of the nature of a simple enzyme, although I understand from Dr. Fleming that his lysozyme appears to increase in quantity under certain circumstances. They might, however, be more complex or more highly-developed enzymes, or pathological enzymes such as may be represented by the transmissible lytic substances found in association with bacterial cultures, but as

the viruses are destroyed by drying, it is probable that they are more highly organised bodies. Further, there is no proof that an ultramicroscopic virus may arise *do novo*, as appears to be the case with the bacterial lytic substances, although this possibility has not been disproved. If then, an ultramicroscopic virus must be placed on a higher plane, it may belong to one of the precellular forms of life, or it may be a special minute bacterium or amœba. The fact that some of the ultramicroscopic viruses are not injured by concentrated glycerine seems to point to their being representatives of a lower form of life than that of a bacterium, and the absence of definite proof of cultivation is evidence in the same direction. On the other hand, if they belong to one of the theoretical precellular forms of life, where possibly there is little if any detectable structure of the molecules, the absence of staining and of visibility can be easily accounted for, and this would also explain the absence of visible surface growth on solid media. The production of turbidity and of visible microscopic particles in a Noguchi tube might easily be explained as being the result of growth rather than the growth itself—if growth of the virus does occur—but it is equally possible that it may be a result of some change in the fresh tissue which forms an essential part of the medium. The fact that some of the ultramicroscopical viruses will pass only a coarse filter, is suggestive of their not being so exceedingly minute, especially when one considers the size of the leptospirillum of yellow-fever, and the spirochaete and vibrio-spirilla which I cultivated. The smallest of these are undoubtedly the vibrio-spirilla obtained from soil, but these would have been possible to see had they been considerably smaller. On the other hand, we have seen that filter-passage does not entirely depend upon size. In some diseases, one drop of the virus-containing filtrate is sufficient to reproduce the disease. One would, therefore, expect the virus to be present in large number. Yet they cannot be seen or stained, and this fact certainly points to their belonging to another form of life than that represented by bacteria.

From what has been said, two important points appear to stand out above the rest. Experiments with certain lysins show that these may increase in quantity, and may show characters not dissimilar to those presented by an ultramicroscopic virus. The idea, therefore, that these viruses must be definite living structures of a bacterial nature because they increase in quantity in the host, has been proved to be an unjustifiable assumption. There remains also the important fact that we are unable to demonstrate the existence of those forms of life more primitive than the bacterium which theoretically we are bound to consider must exist as particulate bodies. These two points, in conjunction with many others to which allusion has been

made, undoubtedly indicate that an ultramicroscopic virus belongs to one or more of those forms of life which in the scale of evolution are situated between the simple enzymes and the bacteria.

Clinical.

SUCCESSFUL INJECTION TREATMENT OF BOG SPAVIN AND OTHER BURSAL ENLARGEMENTS.

By WM. COLLINSON, M.R.C.V.S.,
Anston, Sheffield.

I NOW, as promised, forward you a few notes on my treatment for bursal enlargements. Twenty years ago I purchased a well-known make of syringe and solution for injection in bog spavin. My first and only case treated with this was a very good shire gelding, 3 years old, with one hock affected. Animal was cast, joint aspirated, and solution injected, as per instructions. In three months the hock became anchylosed and the swelling, instead of being soft, was as hard as a board, through bony deposit. Animal after a very long rest finally made a slave.

I still thought this was the right line of treatment, but that the injection was too strong. My experience with blisters, absorbents and firing had not been very encouraging, so I set out to try and find a suitable solution for injecting, and made observations whenever opportunity occurred.

The first injections used were tincture of iodine, and later stronger iodine solutions and combinations. In some cases I got very good results, but they were very few and far between, the majority showing no improvement, but on the other hand no ill effects from the injection.

About 14 years ago I hit upon the present injection and have used it ever since. I now carry a syringe and bottle of solution in my bag, and use it as routine practice whenever a case presents itself.

I do not claim the treatment to be infallible, but to be far and away the best and most rational up to date. The solution is a mixture of antipyrin, spirits of tannin and alcohol.

The points in its favour are :—(1) One gets right at the seat of the trouble ; (2) there is no blemishing, and even where a cure is not effected, and the case remains as at the commencement, any other treatment can then be tried if so desired ; (3) the simplicity of the operation ; the animal rarely requires casting, a twitch being the only restraint necessary, and in some animals this can even be dispensed with.

I use the injection in all bursal enlargements, joints or otherwise, of course using discretion, as there are some that nothing could cure; it is obviously a waste of time to inject these, as well as being not satisfactory for the practitioner or his client.

Since operating at the summer meeting of the North Midland Veterinary Association at Sheffield, in 1919, I have had a good many enquiries from practitioners for the solution and instructions; also many gratifying letters regarding the results of same, with such quotations as the following:—

"I have injected an animal suffering from severe stifle lameness and enlargement, and I am pleased to say it has made a knacker into a useful working animal, or has effected a complete cure."

I have had very gratifying letters (the originals of which I have) *re* boggy hocks, thoropins and other bursal enlargements, and these only bear out my own experience, so until I get something better shall continue the treatment.

I have now operated upon several hundreds of horses, and the following are a few instances taken at random:—

Stifle Lameness.—Roan shire mare, 7 years. Lame near stifle; had been lame at least 12 months. This animal had a lot of pain and stood with leg elevated continually; was in very poor condition and had to be assisted to rise. Injected 20 cc. As the swelling and lameness was much worse for a fortnight or three weeks I contemplated putting the animal in swings, but she managed without and laid quietly when down, getting up with assistance. She gradually improved after the first month, and in five months was cured and fat. This animal was in foal at the time and carried it through and reared a good healthy foal. The owner kept this mare seven years after and worked her regularly; she bred him four foals and never went lame again.

Thoropin.—Bay shire gelding, 4 years. Large thoropin near hock, as big as a very large cocoanut on the inside of the hock and as big as a hen egg outside. Injected 30 cc. inside and 10 cc. outside. This animal recovered in five months; the owner kept him 12 months in regular farm work and then sold him to a dealer as sound. In my opinion the treatment is nearly a specific for thoropin.

Bog and Thoropin.—Bay entire. Both hocks affected. Injected 10 cc. into each bog. spavin, and 10 cc. into each side of the thoropins, 60 cc. in all. This case was operated on about seven years since and it is only about two months ago that I saw the owner. He informed me that the animal made a perfect recovery and was sold for a good figure. He said the animal was very lame and the hocks swollen enormously for seven or eight weeks after the injection, when the

swelling commenced to subside, and the hocks were normal in six months.

Bursal Enlargement in front of fetlock joint. Brown shire mare with a swelling as large as a hen's egg. Injected 10 cc. of the solution. There was a fair amount of swelling, but no lameness, and the animal worked all through, there being a complete cure in ten weeks.

Windgalls.—Bay trap mare, 9 years. This mare had been worked on the Sheffield streets, and the farmer bought her to work on land and run his trap. Injected 5 cc. into each swelling, about 20 cc. in each leg. Considerable swelling and lameness ensued for about a fortnight, when the mare was put to work on the land. There was a complete recovery in four months, after which the animal was driven regularly without a recurrence of the trouble. I saw this animal for three years after the operation; she finally died of a twisted gut.

Enlarged Knee.—Roan shorthorn cow. Knee as large as a small football. Withdrew about a quart of fluid and injected 40 cc. of the solution. Recovery in five months; skin thickening only left. These cases are best treated where there is plenty of grass.

Capped Hock.—Brown hackney show gelding, 5 years. Off hock as large as a goose egg. Drained off 3 or 4 ozs. fluid and injected 20 cc. of solution. The animal made a good recovery in four months, and was sold to a Belgian dealer for a good round sum.

The above are only examples out of a great many cases of my own, and are examples of a good many treated by other practitioners, and if a sufficient quantity of solution has been used the results are the same. I find those using the solution for the first time, and until they see the results of some of their injections, are fearful of using too large a quantity, and consequently inject too little. In this respect I have had no ill effects whatever, the swelling and lameness being the only trouble, and this soon subsides.

[Mr. Collinson has enclosed for persual with this article a large number of personal letters from veterinary colleagues, giving most satisfactory details and records of cases, in which the solution, made up according to his prescription, has been absolutely successful—Ed. Veterinary Journal.]

CRYPTORCHID OPERATION BY FLANK INCISION.

By H. T. RYAN, D.S.O., F.R.C.V.S.,
Cork.

WHEN speaking to fellow practitioners of peculiar cases which I come across, I always find they can tell me about some extraordinary cases they have met, and it invariably occurrs to me what a pity such and such a case was not reported for the benefit of brother practitioners, as in a number of cases the treatment was unique and the result good.

I think the chief reason we don't report our cases is the difficulty of commencing the article. I am faced with the same difficulty now, so it has just occurred to me how it would be to record the case just as it occurred, without any attempt at style, etc.

Monday morning, 10 o.c. Telephone rings. Hello! Is that Ryan? Yes "This is —— V.S. Can you come round and operate through the flank on a rig for me? He is a 3-year-old cart horse, and I removed the right testicle last year but failed to find the left, although I went in through the canal and gave him a devil of a ripping up. He has been starving since Saturday. I tried to get hold of you but failed to do so."

"Right O! I will come along at 2.30 and do what I can."

Operation.—I need not go into details further than to say it was the same as described some years ago by E. C. Winter, F.R.C.V.S.

I have not got this article by me, and it is some years since I read it, but so far as I remember the only variation I made was when the skin facia and external oblique muscle were cut through. I took near hind leg out of hobble and had it pulled backwards before cutting through the external oblique and transversalis, as described by Professor Macqueen in his description of laparo-entertomy operation; by so doing, wounds are not opposite one another when leg is freed; there is a more natural tendency to close, and hence descent of the bowel or hernia is not so likely. However, having got my hand into the peritoneum, the first thing that occurred to me, as it did on numerous previous occasions, was that subject had not been properly prepared—the posterior bowel was full of semi-solid ingesta, of which more anon.

I gave a cursory search for testicle for a couple of minutes, but failed to find it, so made myself comfortable, as I thought I had an hour's work before me.

I withdrew my arm slightly and commenced on a methodical search, and within 20 seconds felt what I thought was a piece of bowel containing semi-solid ingesta. However, before letting it go I put slight traction on it and found it was "held." I then brought

it out through the abdominal wound, and examination left no doubt as to what I had. It proved to be a soft flabby testicle, which I removed with an ecraseur. Peritoneum and wounds were sutured, animal allowed to rise, and fasted for 24 hours.

He never missed a feed afterwards; in fact straw bedding had to be removed and sawdust substituted. Temperature never went over 102°; external sutures were removed on the fifth day, and animal returned home on the thirteenth day after operation, with instructions not to turn him out for a fortnight.

I may mention in abdominal flank operations I always suture the peritoneum, as I have seen done in the human subject, but which is very rarely described in veterinary operations. I remember when I first saw an eminent surgeon being very particular about suturing the peritoneum I asked him why, and he told me if he did not suture it he would probably get ulceration. He mentioned a law case in which a nurse gave evidence that the surgeon had not completely sutured the peritoneum, ulceration followed, and the operator was mulcted in heavy damages.

Re ingesta in posterior bowel. I have performed the operation of ovariotomy on more than 20 mares, and on another occasion opened the peritoneum in search of calculi, etc., and with one exception I always thought how much easier the operation would be if posterior bowel contained none or only soft ingesta. Next time, in addition to physic and fasting, I intend to give animal an enema with 6 ft. of hose in the bowel two hours before the operation.

"GRASS DISEASE," "BORNA DISEASE," "HORSE FLUE." "PARTIAL PARALYSIS OF THE SINGLE COLON."

By W. T. HEWETSON, M.R.C.V.S.,
Brampton, Carlisle.

THESE are the names given to a disease in horses that has become known to the veterinary profession and to some farmers during the last three or four years. Until then the disease was practically unknown in this country. It is one of the most fatal diseases in horses, even more so than that of joint felon in foals; this is largely due to the delay in treatment, the early symptoms of the disease being unfamiliar to the owner. Until the farmer is acquainted with the symptoms manifest in the early stages of the disease, horses will die as a consequence. The cause of the disease is not yet definitely settled.

Some veterinary surgeons believe it is due to horses eating the seeds off the grass; others, that it is due to a specific germ which gains access to the large nerve centres and there gives rise to the

disease. Another opinion is that the primary cause is extreme cold when the animal is least able to resist it.

There have always been ripened grasses to which horses have had access, and this being so, why did horses not take the disease before? If due to a specific germ, we would expect to find the disease contagious or infectious. This has not been my experience.

The horses affected are mostly young, though it has been met with in a 12-year-old foal mare giving suck, and even in old foals whose diet is largely composed of grass.

The best class of horses seem to be affected more readily, pedigreed horses in particular. The disease has been met with in foal mares with foal at foot. Young horses are teething, and this has a tendency to lower their vitality and thus weaken their resistance to cold. The same applies to foal mares giving suck. The disease is mostly seen in June, July, and August, and it is during these months that horses are out of their hair to protect them from the cold north and north-easterly winds that have been so prevalent during these last four or five summers, particularly at night time.

The disease is most commonly met with on high lying and exposed lands, adjoining fells, or in open fields over which the cold winds can sweep. The pasture itself does not give rise to the complaint, for horses grazing on old permanent pastures, luxuriant pastures, poor pastures and pastures where the grass is scarce will develop the disease.

I am inclined to think that the exposure to cold is the primary cause. The exposure to cold has a paralysing effect on the bowels, and thus part of the ingesta is retained. This ingesta undergoes decomposition, and from this a poison is generated, which soon becomes absorbed; it acts upon the nervous system, and so gives rise to the disease. This disease has been met with in winter, but it is much more prevalent in summer, when the diet consists of grass, because grass more readily undergoes decomposition when retained in the bowels than dry food. It is very important that the farmer should be acquainted with the early symptoms of the disease, for to effect a cure the animal requires immediate treatment.

Symptoms.—The horse, when viewed from a distance, may be noticed standing, probably behind a hedge, with his head slightly depressed, his back arched, and his feet tucked under him, whilst his fellows may be grazing. When approached, the horse will move away and commence grazing, appearing to ail nothing, but on continued observation it will be noticed that the horse resumes his former position and again ceases to eat. This is the time the animal should receive treatment. If this is delayed for 24 hours, the following

symptoms will be manifest. The horse will appear duller, and is less inclined to move, will look thinner, the flanks having a tucked-up appearance. Tremors will be seen on the muscles of the shoulders and hips. The breathing may be normal, or a muffled sound may be emitted from the nostrils, as if they were blocked with mucus. On lifting the tail, the skin, denuded of hair, will be found covered with moisture. The temperature may be normal or as high as 105° F. The pulse may be full, or throbbing, or small and weak, running at the rate of sixty or seventy beats per minute, or even more. At this stage of the disease the horse may be covered here and there with patchy perspiration. On opening the mouth a quantity of saliva may fall out, in some cases as much as would fill a teacup.

There are two forms of this disease recognised, namely, the acute and sub-acute. Both forms are serious, particularly if treatment is delayed. When the weather is unusually cold, horses ought to be seen and examined closely twice daily and the early symptoms looked for, and if seen, the animal should receive immediate treatment. A large quantity of poison can be generated in the bowel and become absorbed in 24 hours, and this has a very deleterious effect upon the action of the heart and upon the inner wall of the bowel itself. The heart during this time may become so weak that it will never regain its tone, and the patient as a consequence dies.

A PECULIAR CASE OF HIP LAMENESS.

By CAPT. G. F. STEVENSON.
Royal Army Veterinary Corps.

Subject.—A black L.D. gelding, age 12 years, height 15 hands 2 ins. Horse boarded out on a farm under the Government Boarding Out Scheme.

History.—No complete history was obtainable when the animal was admitted to hospital on May 10, 1922, but lameness was evidently of some standing, as the gluteal muscles showed marked atrophy. It was stated that the horse had done a day's work without any trouble, but was found "dead lame" in the stable in the evening.

Symptoms.—Supporting leg lameness of the near hind; the horse trotting rather on the toe. This lameness was constant but not very severe and did not improve with rest. In the stable the leg was almost constantly held in the air with slight spasmodic movements or rested on the tip of the toe. Manual exploration per rectum revealed pain on pressure in front of the obturator foramen and front

of the os pubis, where is joined the ilium, but no fracture or callus could be felt.

Diagnosis.—Arthritis of the hip joint and possible crack in the innominate bone about the ilio-pubic junction.

Treatment consisted of rest, a high-heeled shoe and infrictions over the hip joint. This produced no improvement and the horse was cast and destroyed on June 28, 1922.

Post-mortem examination revealed the following lesions :—

(1) On cutting into the crural muscles, what appeared to be a large cyst was found in the substance of the vastus internus muscle, about 4 ins. above the patella. This, on being incised, was found to contain clear serous fluid mixed with a little synovia and a semi-caseous necrotic material, probably necrosed muscular tissue. This cyst-like cavity had fibrous walls about $\frac{1}{4}$ in. thick, and the muscle outside the walls was pale, almost white in colour, for about one to one-and-a-half inches. This " cyst " was traced the whole length of the vastus internus muscle up to the hip joint, with which it communicated by a channel large enough to admit the forefinger.

(2) On examining the hip joint the following lesions were found :— The articular cartilage on the head of the femur was almost completely eroded, and the cartilage of the cotyloid cavity similarly affected though not quite so extensively. The ligamentum teres and pubio femoral ligament were partially ruptured, and there was old blood extravasation into the substance of the ligaments. The rim of the cotyloid cavity showed hæmorrhagic inflammation, and the lymphatic glands in front of the os pubis were enlarged and œdematous, but showed no actual lesions. The vastus internus muscle also showed a large necrotic area close to its origin, and this too communicated with the cyst-like cavity already referred to.

(3) Examination of the bones after boiling showed : (*a*) A marked exostosis along the antero-external rim of the acetabulum, and this encroached for about $\frac{1}{8}$ in. on the articular cartilage. This was the area of hæmorrhagic inflammation referred to under (2). There was a large exostosis about 2 ins. by 1 in. and $\frac{1}{2}$ in. deep in front of the acetabulum, and this extended as a diffuse exostosis over the pelvic surface of the bone and encroached on the anterior rim of the obturator foramen. This was the area which showed pain on pressure with the hand in the rectum. (*b*) The femur showed a marked exostosis all round the articular head about the insertion of the capsular ligament. No other lesions were found in the limb except slight distension of the superior sesamoidian sheath with clear synovia, and it seems remarkable in view of the extensive and severe lesions that lameness was not more marked.

TRANSMISSION OF FOOT-AND-MOUTH DISEASE TO A MULE.

By PHILIP VINCENT, M.R.C.V.S.,
Romford.

During the last four years the Italian veterinary journals have recorded several cases of horses and mules being affected with a disease, the symptoms of which very closely resembled those met with in foot-and-mouth disease as affecting cattle.

The most recent case, translated from *La Clinica Veterinaria*, will, I think, prove interesting to the readers of The Veterinary Journal.

A mule, 6 years old, the property of an Italian farmer, was confined in the farm shed with two cows which were suffering with foot-and-mouth disease. The animal had from time to time eaten the food which the cows had left, and he had taken his drink from the same trough. About a fortnight after the cows had been affected with the disease it was noticed that the mule had a difficulty in eating his food, and on closer inspection lesions were found on the mucous membrane of the tongue and lip identical with those which are met with in cattle affected with foot-and-mouth disease ; there was elevation of internal temperature and general constitutional disturbances.

With simple treatment the animal made complete recovery in three weeks.

TRACHEAL ABSCESS.

By J. F. MACDONALD, M.R.C.V.S.,
London.

The subject was an aged draught horse in fair condition, and had been in hard work up to the time of admittance to hospital.

His symptoms appeared to be those of laryngitis, a slight temperature and roaring. The usual treatment was prescribed, and, as the roaring was not very pronounced, no attempt at tracheotomy was made. He had been under treatment two days when I received an urgent message to come and put a tube in.

On arrival I found his breathing was very distressed, and there was no question as to delaying the operation any longer.

To my surprise the insertion of the tube gave no relief, and my diagnosis of laryngtis was obviously incorrect.

The owner, who was present, naturally wondered if the operation had been properly performed, but fortunately was open to conviction. The tube was removed and the trachea explored with the finger as far as possible, but no obstruction could be felt. A second operation was therefore performed about half way down the neck, but with no better result. A diagnosis of some kind had to be made to the

anxious client, so I ventured a rather vague statement that there was an obstruction in the respiratory tract below the seat of operation, avoiding any opinion as to the nature of the obstruction.

After explaining that this was the last hope, I tubed the horse a third time as low down the neck as it was possible to operate. Once again there was no relief, and as the wretched animal was becoming more and more distressed, it became a question as to whether he should be slaughtered or not. Death resulted from asphyxia shortly afterwards, however.

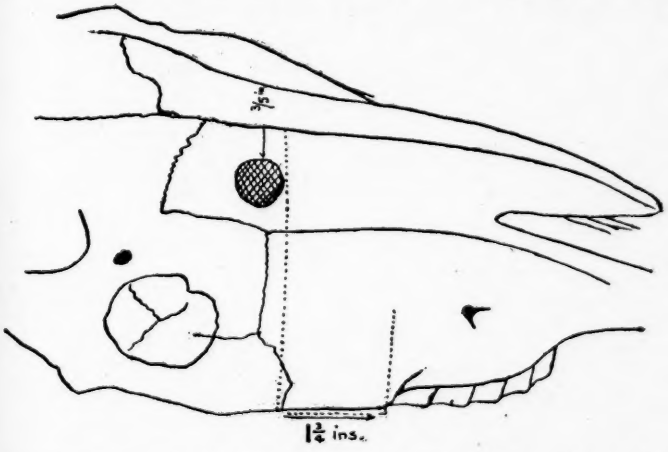
The autopsy revealed a sub-mucous tracheal abscess close to the bifurcation of the trachea. What caused this condition I am quite unable to say, for it is the first time I have ever observed such a lesion.

THE BEST PLACE TO TREPHINE THE FRONTAL SINUS.

By PROF. C. GAVRILESCU.

(Communication to the Society of Veterinary Medicine.)

All surgical works and operators, as far as I have seen, repeat the error of giving the chosen place for trephining the frontal sinus as the region comprised between the internal angle of the eye and the median line. I consider that the place selected is badly chosen, because in



the case of a purulent collection the pus tends to accumulate in the depths of the ethmoidal conchæ which go to the formation of the sinus. As a result all medical injections which are used in treating the malady, in spite of the force of the stream, can never cleanse the walls of the cavity well; and, besides, the pus which is produced in the interval

of injections has no exit outwardly, accumulates in its depth, and keeps up infection by prolonging the malady.

There are cases when one exposes the sinus widely, as, for example, when one wants to extirpate tumours occurring in the interior of the sinus ; but trephining as usually practised in the case of simple purulent sinusitis is useless to remove extensive decay of the tissues. In this case the opening made by the crown of the trephine is sufficient to treat the sinus providing it be practised lower down than the region where it is usually performed.

When one looks at the bone in one's hand opened at the classic place usually selected, one can convince oneself that at the division of the inferior axis of the circle described by the crown of the trephine up to the lower end of the ethmoidal trumpet, there is a distance of about 3 to 3½ inches, so that it is not possible that medicated injections may be quickly followed with success given the depth and form of the cavity.

We estimate that to obtain a more rapid cure of the ailment the place of choice ought necessarily to be changed, and that the operation ought to be carried out lower down *in the nasal region at a distance of 3-5ths of an inch from the median line immediately above a horizontal line which divides the maxillary spine about 1¾ inches from its summit and rejoins perpendicularly the median line* (*see figure*).

The opening being practised in this region has the undoubted advantage of securing the discharge of pus and facilitating the medicated injections, well cleansing the walls of the cavity, and thus accelerating cure.—*Archiva Veterinara.* G. M.

EVENTRATION OF INTESTINE IN A FOAL AND RECOVERY.

By F. H. SANDERSON, M.R.C.V.S.,
Darlington.

THE patient, a cart foal filly, 4 months old, had been injured in trying to get over a gate and had a rupture in the flank about 6 inches long.

When it was cast and tied up I found a serous abscess pointing in the lower portion, which burst when the animal struggled, the result being that fully two yards of bowel became eventrated. This fell on the grass, and it was only with the greatest difficulty that it could be returned, and, although I washed it with disinfectant water, I was very dissatisfied with the result. In fact, not thinking it at all possible for the foal to recover, I merely plugged the wound in the skin with some tow and cotton-wool and advised the owner to shoot the beast. This he was unable to do at the moment, but, as I heard nothing from him during the next few days, I surmised that it had been done.

About three months later he informed me that the foal seemed so bright during the evening that he decided to await developments, and that it had made an uninterrupted progress towards recovery. The plug dropped out about three days afterwards.

It was a lesson to me that one should not be too ready to despair over these cases, but try what can be done.

ECTOPIA CORDIS IN A BULL.

By W. E. ISON, F.R.C.V.S.,
Examiner in Anatomy to the Royal College of Veterinary Surgeons, Atherstone.

In July, 1920, I was called in to examine a valuable pedigree Shorthorn bull calf of one day old on account of a large swelling, as large as a coconut, protruding in the front of the chest.

I found, on examination, that I could, upon pressure, force it back into the thorax, and I also found, upon palpation, that it was beating rhythmically, as is usual with a normal heart. In fact, I had no difficulty in diagnosing it as a case of *Ectopia Cordis*: the heart being situated outside the normal thorax and only covered by the natural skin.

This animal lived for two years, but was somewhat undersized. He was used as a sire, as his pedigree was a very valuable one, and died suddenly during the act of copulation.

Post-mortem examination revealed the heart outside the pericardium, the latter being very elongated and narrow, and extending from the frontal region to the diaphragm. The chest cavity was very restricted, and the diaphragm had become withdrawn into the thorax itself.

TORSION OF THE UTERUS IN A COW.

By H. B. COLLETT, B.V.Sc., M.R.C.V.S.,
Tring.

On the afternoon of June 4 the cowman in charge of a small herd of Jerseys asked me to see one of the cows which was due to calve. He was afraid that she had milk fever.

An examination of the cow at first glance gave this impression. She was lying down. She could, however, rise, but with a peculiar sort of sag to the loins. Once up she would move a little, very stiffly, and would then lie down again. When lying down she would look round at her flank in a manner similar to a horse suffering from subacute obstruction of the double colon. This led to a rectal examination being made, and on manipulation it was quite obvious that something was radically wrong. On pressing down there could be felt, extending forward, what gave one the impression of a piece of

thick, slightly kinked rope. On making a vaginal examination it was impossible to insert much more than the hand and wrist. By this time it was obvious that torsion of the uterus existed, but I was unable to decide on the direction of the spirals.

The cow was taken outside on to a piece of sloping ground and cast. All four feet were secured, the fore feet being brought well back and the hind feet well forward. The animal's head was uphill, and she was lying on her left side. While I retained a hand in the vagina, assistants were directed to roll the cow over on to her back and then to her right side. This had the effect of increasing the twist. The cow was now brought across the length of the slope and rolled from her right side on to her back, left side, belly and back again to the right side, thus working a complete turn. As matters seemed slightly better, the turning was repeated until some eight or nine turns had been made. At this stage the os uteri could quite easily be examined, and it was sufficiently open to allow the insertion of a couple of fingers. The cow was allowed to rise, and it was evident that improvement had taken place, as she moved fairly freely and commenced to graze. On being returned to the stable she lay down and began to ruminate.

Later in the evening (9.30 p.m.) a second visit was made and the cow found to be quite easy. A vaginal examination showed the *os uteri* to be a little more dilated, but not enough to allow the passage of the hand. The fœtal membranes were intact. The cow at this stage began to show signs of labour, and it was decided to leave her to herself. The following morning a portion of the fœtal membranes was protruding from the vulva, and on examination the os was found sufficiently dilated to allow, with ease, the passage of the hand. The fœtus was lying on its left side in the dorso-iliac position and with its fore legs flexed at the knees. The legs were straightened out, drawn through the os and corded, but as the os was insufficiently dilated to allow the passage of the whole fœtus, embryotomy was decided upon. The left leg was removed by skinning back and then tearing the scapula from the thorax. This reduced the size of the fœtus sufficiently to allow the head to be brought through the os into the vagina and again outside the vulva, but it was still impossible to extract the fœtus. The head was secured and then the other leg removed in similar fashion to the first. Extraction now was easy, all the membranes coming away with the calf. The uterus was irrigated and the fluid syphoned off. The uterine contractions were good. Recovery was uneventful, the only further treatment required being vaginal douches necessitated by a certain amount of bruising and ensuing sloughing.

FATAL ACCIDENT TO A COW AS A RESULT OF AN INJECTION OF VERATRINE.

By Monsieur BUZENAC.

Veratrine, considered by the great majority of practitioners as the specific alkaloid for indigestion in cattle caused by impaction of the rumen, may occasion serious mishaps. In the observations made by M. Buzenac, a subcutaneous injection of 10 centigrammes of sulphate of veratrine caused extremely violent colic, accompanied by expulsive efforts and great nervous excitement, ending in death in two hours.

No autopsy was made, and it is not known whether the symptoms observed were due to visceral rupture, congestive trouble, etc. M. Troussier, who has frequently noted serious accidents due to hypodermic injections of veratrine, advises the following formula:

Sulphate of Veratrine	.. ..	30 centigrammes.
Hydrochloric acid	.. ..	30 grammes.
Tincture Ipecac.	.. ..	150 grammes.
Water	.. ..	150 ,,

Two tablespoonfuls every three hours in aromatic tea.

[We think the most important factors in the treatment of impaction of the rumen are frequently ignored or forgotten by practitioners, and these are an enforced abstinence *from all food for at least four days*, and that copious draughts of linseed tea alone be allowed. From five to eight days afterwards the rumen ought never to be filled, but only small quantities of food be given. By this means and a combination of arecolin, veratrine, and strychnine given in linseed tea, and raising the cow's fore-end, we have had some good successes. This therapy is based on the assumption that impaction of the rumen is due to its atony or paralysis.—*Translator.*]—*Société des Sciences Veterinaires.*

G. M.

DUODENAL ULCER IN THE DOG.

By F. J. TAYLOR, M.R.C.V.S.,
Bath.

For the second time I have a typical case of ulceration of the duodenal tract to describe.

Subject.—A pedigree wire-haired terrier, 14 months old.

History.—Was apparently in perfect health when inoculated for distemper with an approved vaccine.

Symptoms, which form the interesting features of this case: Three weeks after inoculation sub-acute manifestations of distemper were shown by a slight husky cough and the typical eczematous rash inside the thighs; a depraved appetite alternated with disinclination to feed at all, but continued to be very lively, and game to play, but with a tendency to easily tire and quarrel with his companions.

These symptoms passed away in about a week and he became an almost normal animal, but refused to go long distances, and showed at times extreme dullness and lassitude, and strongly objected to being picked up suddenly; an occasional jelly-like diarrhœa, with no blood, was observed about every third day; otherwise the dog seemed quite normal, but as several weeks elapsed the pain, on manipulation in the duodenal region, became more pronounced, the lassitude increased and diminution in weight induced me to form a definite opinion that ulceration of the duodenum was the cause of these somewhat obscure symptoms, and I destroyed him with morphia and chloroform.

On post-mortem examination all organs were quite healthy, apparently, except the duodenum, which was much thickened and had seven ulcers in various stages upon its mucous surface, two of which were almost perforating the serous coat.

The stomach itself was normal, and there was no ulceration of the pylorus; the ductus choledochus and pancreaticus were almost occluded by thickened membrane, but these organs seemed unaffected.

I am of opinion that dogs suffer from duodenal ulcer to a greater extent than is at present diagnosed, and I should value other opinions on this point.

A peculiar and distinctive feature, to my mind, was that this animal (which was one of my own, and therefore I had every facility for constantly observing symptoms) never rested, like other dogs, and always seemed uncomfortable, slightly whining at times, and when the stomach was empty suffered from acute flatulence and evident pain on pressure. This was usually two or three hours after food. On being again fed he became a normal dog again, quite bright and inclined to play.

All treatments in regard to peptonised foods, meat extracts and sedative medicines were adopted, but no treatment was of permanent benefit.

For the descriptive anatomy and diagrams of this case refer to "Bradley's Dissection of the Dog," pages 36 and 37.

INTESTINAL PERFORATION BY ASCARIS MYSTAX IN THE DOG.

By G. MAYALL, M.R.C.V.S.
Bolton.

THE dead body of a 9 weeks old wire-haired fox terrier "Betty," was brought to us on August 3 for post-mortem examination. The owner had purchased the puppy twelve days previously for £3 10s. The autopsy showed that the stomach contained no food, but was

packed with ascarides; the duodenum also was full of worms, and fine specimens had passed up the bile duct. These were dead and bile-stained. One member had just passed through the intestine and was present in the abdominal cavity free and in a live state. The large intestine was free from the parasites except the terminal portion of the colon. There was no food at all in the intestinal tract, but a catarrhal condition of the mucosa was present throughout. The worms were 59 in number, and varied in length from ½ ins., to 5 ins., the great majority being about 4 ins. long.

AN INTERESTING CYSTOTOMY IN A BITCH.

By FREDERICK HOBDAY, C.M.G., F.R.C.V.S., F.R.S.E.
Kensington, London.

THE patient, a well-bred fox-terrier bitch, seven and a half years old, was seen in consultation with Mr. C. W. Howard, M.R.C.V.S. of Dorking, and was showing considerable pain and irritation whenever she passed urine.

The history was that she had had a litter of pups when 4 years old, but none since. When five years old she had a urinary stoppage, for which Mr. Howard had found it necessary to remove the urine by the aid of the trocar and cannula. During 1919 and 1920 she had several attacks of cystitis, but none of them gave great alarm to the owner, who was devoted to the little animal, and scarcely ever allowed her to be out of sight.

In 1921 she had an acute and very painful attack of cystitis, and from that date the irritation and difficulty experienced when urinating was incessant. A skiagraph taken in 1918 had revealed the presence of calculi; it was not until September, 1921, that I was called in.

A sound passed into the bladder, together with manual examination, readily verified the presence of calculi, which could be heard to rattle together, and an operation was decided upon. Under chloroform anæsthesia the suprapubic position was chosen, the bladder being exposed and incised in the usual way, and three large calculi, weighing 1¾ ounces, were removed. Recovery was uneventful, and with the exception of one small buried suture, the wound gave no anxiety or trouble whatever. She has recently had a litter of five puppies.

Review.

DIE WICHTIGSTEN PARASITISCHEN PROTOZOEN DES MENSCHEN UND DER TIERE (The Most Important Parasite Protozoa of Men and Animals). By PROF. DR. W. NÖLLER, Berlin. First Part of Vol. I of "The Animal Parasites of the Domesticated Animals,"

with 113 figures in the text and three coloured plates. Published by Richard Schœtz, Wilhelmstrasse 10, Berlin, 1922. Price 450 marks.

THIS first portion of what is to be a monumental work on parasites comprises 272 pages. It deals with the general knowledge and examination of parasitic protozoa, with the characteristic formation and mode of life of protozoa, with the technic of the examination of parasitic protozoa, the breeding and methods of examination and isolation of protozoa, divisions, literature. There is a special section on the parasitic rhizopods.

The volume shows evidence of thorough research and erudition, and is a masterpiece on the subject of which it discourses. The figures in the text are exceedingly well done, and add considerably to the lucidity and interest of the reading matter. To those with a limited knowledge of German pp. 52, 53, and 54, on the protozoa as parasites and originators of disease, will perhaps be of greatest interest. Trypanosomes, coccidia and malaria parasites, along with several others, are discussed.

The references to the literature on protozoa are very numerous, and all the principal authorities are culled for contribution to the elucidation of the subject. The work is not a text-book, but it will be a very complete book of reference in the study of protozoa.

G. M.

Personal.

IT will doubtless interest members of the profession to learn that His Royal Highness the Prince of Wales has been graciously pleased to accept a copy of *Canine Distemper*, by Captain Hamilton Kirk, M.R.C.V.S., which was recently published by Messrs. Baillière Tindall and Cox.

THE whole profession will learn with regret of the unexpected death of Mr. Frank Garnett, C.B.E., J.P., F.R.C.V.S., a firm and popular President of the Royal College of Veterinary Surgeons during the troublesome time of the Great War and one who piloted the profession through some very rough seas.

We hope to be allowed to do further honour to his memory in a later issue.

NOTICES.

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